US Army Corps of Engineers®
Engineer Research and Development Center

U.S. Army Corps of Engineers Field Research Facility, Duck, NC

Purpose

The U.S. Army Corps of Engineers (USACE) Field Research Facility (FRF) is one of the few places in the world that provides a dependable means of obtaining comprehensive measurements even during severe storms when significant coastal changes occur. Located in Duck, NC, the FRF was established by the USACE in 1977 to support its coastal engineering research requirements. Since its creation, the facility has maintained a comprehensive, long-term monitoring program of the coastal ocean including waves, tides, currents, local meteorology, and the resultant beach response. A small, highly skilled field staff and several unique vehicles support the monitoring program. Because the site is representative of many U.S. coastal locations, FRF data are used worldwide to help meet the need for field data to calibrate and verify analytical, numerical, and physical model predictions. In addition, the availability and high quality of FRF data make it ideal for use in ground-truthing a wide range of new oceanographic in situ and remote sensing sensors and techniques.

Specifications

The FRF is located on 712,000 square meters (176 acres) which includes 1,000 m (3,300 ft) of frontage along the Atlantic Ocean and the shallow brackish Currituck Sound. The facility consists of a 560-m- (1,840-ft-) long research pier, a main office building, two field support buildings, and an observation tower. The research pier is a reinforced concrete structure supported on steel pilings. The pier deck is 6.1 m (20 ft) wide and extends to a nominal depth of 6 m (20 ft) at a height of 7.6 m (25 ft) above the National Geodetic Vertical Datum of 1929 (NGVD). Located on the pier is the crane-like Sensor Insertion System (SIS), which can be moved to any location on the pier. It is equipped with wave gauges, current meters, and sediment-transport sensors, can be operated in 5-m (16-ft) waves, and is able to reach 15 to 24 m (50 to 75 ft) out from the pier to minimize the local

influence of the pier on the measurements. The SIS is a diverless-platform which is ideal for deploying or testing oceanographic sensors. The 40-m (130-ft) tall observation tower is climbable and designed to support video remote sensing observations and to hold radio antennas. FRF vehicles include the 10.70-m (35-ft) tall Coastal Research Amphibious Buggy (CRAB), used primarily for surveying and other tasks in the nearshore such as instrument deployments and maintenance, sand sampling and vibracoring, cable laying, towing instrumented sleds, and functioning as a mobile platform for diving operations. In addition, two 10.7-m (35-ft) tall Lighter Amphibious Resupply Cargo (LARC-V) vehicles support operations in deeper water or remote from the FRF. These vehicles support diving operations, conduct hydrographic surveys, tow sidescan and sub-bottom seismic instruments, lay and retrieve cables, and deploy and maintain buoys and instruments.

Benefits

Federal, state, university, and private sector researchers are encouraged to take advantage of the unique capabilities of the FRF. Users gain access to real-time and historic FRF data, the specialized vehicles, and logistic expertise. With nearly 200 years of corporate field experience, the FRF staff is known for their ability to design experiments that can survive the harsh conditions of the nearshore, whether caused by a passing northeaster or hurricane. In many instances the availability of the CRAB, LARC, or SIS has allowed experiments to be conducted that would not be possible elsewhere. As an example, the CRAB's ability to be accurately located and to remain in position, regardless of the wave conditions, has been used to create large, precise arrays of bottom-mounted pressure sensors, current meters, and other oceanographic sensors that have provided new measures of ocean phenomena. Bathymetry collected by the CRAB provide detailed maps of the bottom, which are fundamental to most experiments. Since ambient conditions (waves, winds, tides, etc.) are constantly measured, users only need to deploy their own sensors, greatly reducing the cost and complexity of experimenting elsewhere. They can also use the FRF's long-term data summaries to select periods of the year when they are most likely to obtain desired conditions (calm, storm, changeable, etc). The FRF has a long history of supporting the experiments of others and these experiments, along with the other activities at the FRF, have resulted in a wealth of new coastal knowledge.

Success Stories

Through its research, and by hosting a series of multiagency, multiinvestigator experiments extending over 25 years, the Duck beach has probably become the most studied beach anywhere in the world. The major experiments have been given clever names like "DUCK94", "SandyDuck" and "SuperDuck" and were sponsored by the Corps of Engineers, the Office of Naval Research, and the U.S. Geological Survey. These experiments alone have contributed significantly to knowledge of the nearshore zone and

have led to the discovery of "Shear Waves" an important nearshore phenomena, along with the quantification of other processes such as wave transformation, sandbar morphology, and sediment transport. A wide variety of experiments have taken advantage of the FRF to study topics such as: the remote sensing of waves, currents and bathymetry, underwater mine detection and burial, power generation by waves, the detection of atmospheric aerosols, wave slopes, bottom roughness, and many others. Results have appeared in a growing number of published reports including approximately 350 journal articles, reports, and conference proceeding papers by more than 200 authors.

For more information, refer to the Field Research Facility Home page at *www.frf.usace.army.mil/frf.stm*

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